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SHOULD VITAMIN D BE GIVEN ONLY TO INFANTS?

VITAMIN D has been so successful in preventing rickets during infancy that there has been little emphasis on continuing its use after the second year.

But now a careful histologic study has been made which reveals a startlingly high incidence of rickets in children 2 to 14 years old. Follis, Jackson, Eliot, and Park* report that postmortem examination of 230 children of this age group showed the total prevalence of rickets to be 46.5%.

Rachitic changes were present as late as the fourteenth year, and the incidence was higher among children dying from acute disease than in those dying of chronic disease.

The authors conclude, "We doubt if slight degrees of rickets, such as we found in many of our children, interfere with health and development, but our studies as a whole afford reason to prolong administration of vitamin D to the age limit of our study, the fourteenth year, and especially indicate the necessity to suspect and to take the necessary measures to guard against rickets in sick children."

*R. H. Follis, D. Jackson, M. M. Eliot, and E. A. Park: Prevalence of rickets in children between two and fourteen years of age, Am. J. Dis. Child. 66:1-11, July 1943.

CASE REPORT NO. 8

NUTRITIONAL EDEMA

Dr. Sidney Ross

M.T., a seven year old white male, entered the hospital on December 27, 1944 with a chief complaint of vomiting of ten days duration together with scrotal and abdominal swelling of five days duration.

The patient was ostensibly well until ten days prior to entry at which time he began to vomit shortly after meals, the vomitus consisting of ingested food particles and being non-projectile in character. This persisted intermittently during the next two days. The patient was noted to manifest a certain degree of drowsiness and apathy during this period.

Five days prior to entry his abdomen and scrotum became edematous, followed three days later by swelling of the face, eyelids and ankles. During this interval the patient had oliguria and his urine was noted to be deep yellow. There was no attendant fever, pain, headache, convulsions, orthopnea or dyspnea.

Family history was non-contributory.

Except for measles, there was no history of any previous illness, the child presumably having always been healthy and active.

A careful interrogation regarding the patient's dietary history revealed that the child's appetite was a capricious one and his mother complained that he frequently surfeited himself with candy, cake and condiments between meals, blunting his appetite for his regular meals. He drank one or two glasses of milk a day, ate small amounts of meat or fish three or four times a week, and partook freely of bread and butter, green vegetables and cereals.

No anasarca was noted at any time prior to the current episode.

Physical examination revealed a moderately well developed seven year old white male who did not appear acutely ill. A generalized edema involving the eyelids, face, sacrum, and ankles was present. Teeth were dirty and carious; pharynx was mildly injected with slight tonsillar hypertrophy. There was diminished to

Date	Wt. Lbs.	Edema	Protein	Albumin	Glob.	A/G RATIO	Oncotic Pressure	Diet Protein GMS/Day	Comment
12/26/44	56	2+						40	GENERALIZED EDEMA MARKED WITH ASCITES, PLEURAL EFFUSION.
12/28/44	60	2+	3.04					40	
12/30/44	61	3+	2.83	2.27	.56	4.0	13.3	40	
1/3/45	60	3+	2.76	2.62	.14	18.0	14.6	40	LISTLESS ANOREXIC
1/5/45	60	3+						100	
1/6/45	53	±	4.28					100	←MARKED DIURESIS
1/9/45	46	0	4.59	2.99	1.60	1.86	18.7	100	
1/10/45	47	0	4.49	3.11	1.38	2.20	19.0	100	NO DEMONSTRABLE EDEMA.
1/11/45	47	0	4.21	2.25	1.96	1.14	15.1	100	APPETITE GOOD AMBULATORY ACTIVE
1/15/45	49	0	6.83	3.78	3.05	1.20	25.0	110	
1/21/45	50	0	6.85					100	

absent breath sounds and flatness to percussion over both lung bases posteriorly, suggestive of fluid in the chest. The heart was normal to percussion and ausculation. The abdomen was markedly distended and tense, with a fluid wave and shifting dullness readily elicited. Sacrum and ankles showed two plus pitting edema. Physical examination was otherwise negative.

Blood pressure 120/75; temperature 99°; pulse 90; respiration 24; weight at time of admission was 55 pounds. Subsequent daily blood pressure determinations were all within normal range.

Hemogram showed an R.B.C. of 4,940,000 with 15 gms. of Hgb. The W.B.C. was 16,600 with 65% polys. Urine examination on admission showed 10 mgm. albumin and a few W.B.C. but was otherwise negative. Subsequent daily urines contained an occasional W.B.C. but no albumin or R.B.C. Specific gravity ranged between 1.023 to 1.030. Blood cholesterol was 80 mgms. %.

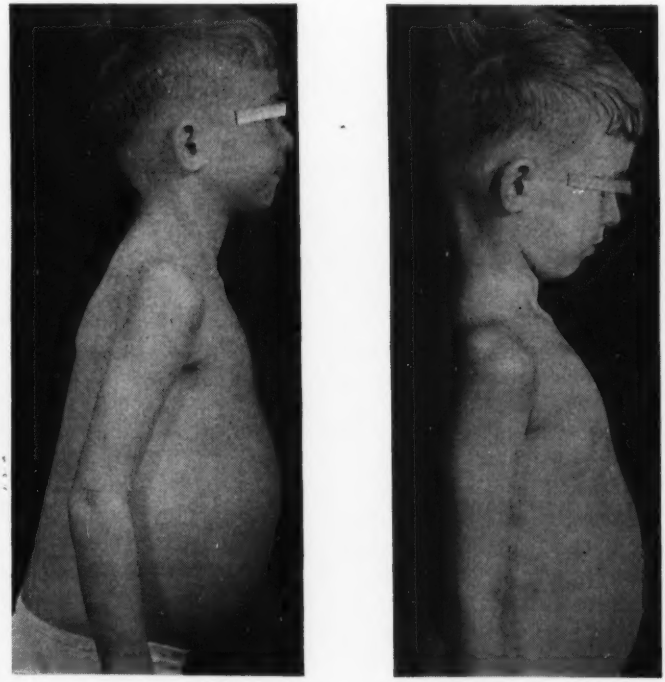
X-ray of the chest revealed a dense, opaque shadow in the right and left bases, obliterating both costophrenic angles, which was interpretcd as being consistent with pleural fluid. The heart was normal in size, shape and position. Intravenous pyelogram

was negative. N.P.N. was 45 mgms. %. Tuberculin test was negative.

The total serum protein at the time of admission was 3.04 grams per 100 cc; two days later the protein level was 2.83 grams per 100 cc with 2.37 grams albumin, .56 grams globulin, the A/G ratio being 4/1.

On January 4, 1945, after eight days on a low fluid, salt free diet containing a relatively inadequate protein intake, the serum protein was 2.71 grams per 100 cc with 2.62 grams albumin and .14 grams globulin.

The patient was then started on a high protein regime containing approximately 4.5 grams per kilogram of body weight (100



LEFT: **PATIENT ON JAN. 3, 1945 BEFORE HIGH PROTEIN DIET STARTED. TOTAL PROTEIN WAS 2.76 GRAMS PER 100 CC. WITH 2.62 GRAMS ALBUMIN.**

RIGHT: **PATIENT ON JAN. 8, 1945, 3 DAYS AFTER HIGH PROTEIN REGIME INSTITUTED, ILLUSTRATING A CONSIDERABLE REDUCTION IN THE GENERALIZED EDEMA. TOTAL PROTEIN AT THIS TIME WAS 4.59 GRAMS PER 100 CC. WITH 2.99 GRAMS ALBUMIN.**

Courtesy of the X-ray and Photography Depts., Children's Hospital, Wash., D. C.

grams per day) with high vitamin supplements and additional plasma infusions, the latter totalling 1100 cc. in nine days. Following this adequate dietary intake, the serum protein rose rapidly. An analysis done five days later showed a total protein of 4.49 grams per 100 cc with 3.11 grams albumin and 1.38 grams globulin, and six days after that, the total protein was found to be 6.83 grams per 100 cc, with 3.78 grams albumin, and 3.05 grams globulin. Concomitantly, the generalized anasarca disappeared with extraordinary rapidity; within the first five days the patient lost 11 pounds in edema fluid. (See plate) No diuretics were employed.

Clinically, the patient appeared considerably improved, and his appetite remained excellent.

DISCUSSION:

Dr. Sidney Ross—In certain cases, edema will develop in the absence of any evidence of renal or cardiac disease. This type of edema was extremely prevalent after World War I in central Europe, and undoubtedly, will be similarly prevalent in this war due to the grossly inadequate diets which a sizeable portion of the European population has been forced to subsist on. This disease has been variously termed war edema, prison edema, nutritional edema etc.

In the case under discussion, the patient exhibited edema without evidence of cardiac renal disease; a restricted diet was the chief cause of the edema.

The significance of the serum protein as a controlling factor in the distribution of fluids between plasma and tissues is well known; a normal balance between capillary blood pressure and plasma colloidal osmotic pressure is perhaps the most important factor in maintaining the usual distribution of fluid between blood and tissues[1]. Other factors are also concerned. Krogh[2] has shown that the exudation and eventual reabsorption of fluid in the intercellular spaces will depend on the capillary blood pressure, the permeability of the capillary wall, the efficiency of the lymph flow and the metabolic activity of the tissue cells. In addition, the importance of mechanical pressure must also be noted; certain tissues such as those under the eyes, because of their inherent looseness are particularly prone to edema even when not exposed to the aggravating influence of hydrostatic pressure.

The normal total serum protein ranges between 6 and 8 grams per 100 cc, with 3.6-5.0 grams albumin, and 2.0-3.5 grams globulin. From molecular weight determinations, the albumin molecule is considerably smaller than that of globulin; a given concentration by weight of albumin therefore must exert a greater osmotic pres-

sure than the same concentration of globulin. It has been estimated[3] that the osmotic pressure of 1 gram percent of albumin in serum is 5.5 mm Hg. while that of a similar solution of globulin is only 1.4 mm Hg. The sum represents the total colloidal osmotic pressure (oncotic pressure) exerted by the serum proteins. It has been demonstrated by several investigators[1, 3] that the determining factor is the level of serum albumin, with ascites, pleural effusion and edema of the legs always appearing when the albumin was reduced to critical level. Weech and Ling[4], in their report of 18 cases of nutritional edema, found that edema was never present in their series when the serum albumin was greater than 2.9 grams/100 cc and was never absent when albumin was less than 2.5 grams/100 cc; these investigators concluded that the globulin fraction seemed to exert a minor role, and that lowered serum globulin may be regarded as an indicator of concomitant albumin deficiency and not as a direct cause of edema. The extreme variability of the globulin fraction was thought to render reversal of the A/G ratio a much less constant feature than in nephrotic patients.

Our own results are in substantial agreement with that of Weech and Ling's[4] report; when our patient's serum albumin was below 2.68 grams per 100 cc, the anasarca was marked; when beginning mobilization of the edema fluid occurred, the serum albumin, concomitantly, had risen to 2.99 grams/100 cc. When once diuresis had occurred, it was rapid, progressive and complete, and presumably due entirely to the rise in the colloidal osmotic pressure of the serum protein since no diuretics were used. Attempts to eliminate edema by the use of diuretics alone without simultaneously increasing the serum albumin above the critical level of 2.5 grams/100 cc have been found to be ineffectual.

The undoubted usefulness of amino acid mixtures and plasma for parenteral administration as a source of protein needs no elaboration here. However, it would seem that the most effective and economical method of administering protein in nutritional edema is by means of oral ingestion of foods containing a high protein content.

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CASE REPORT NO. 9

CEREBELLAR ASTROCYTOMA

Dr. Julius Loebl C.P. - 44-8202

C.P., a nine year old colored boy, was admitted to Children's Hospital on November 18, 1944. The chief complaints were vomiting and frontal headaches which had been present for three weeks. At the time of onset he had vomited at school and had been sent home. Castor oil and Anacin tablets seemed to relieve him promptly and he returned to school after three days. Two days later, however, these symptoms recurred. He was kept in bed for a week and again improved. On the day of admission these same symptoms, vomiting and headaches, suddenly recurred. The boy never had any fever, convulsions, or vertigo. There was no history of injury, or complaints of visual disturbances. A slight cough became manifest on the day of admission. The family history was essentially normal as was the patient's past history, except for an admission to Gallinger Hospital at the age of two years, for malnutrition and anemia.

Physical examination upon admission revealed the patient to be a normally developed and nourished nine year old colored male who slept throughout the entire examination. Blood pressure 116/70. Pulse rate 56. Pupils were equal, regular, and reacted promptly to light. The tonsils were large, ragged, reddened and studded with follicles. Heart, lungs and abdomen were essentially normal. Kernig's sign was questionably positive bilaterally. Brudzinski's sign was negative. The quadriceps reflexes were active.

The Hemogram was within normal limits as were repeated urinalyses. Blood Kahn was negative.

The following day the patient was seen by Dr. Lambros in consultation. He found him to be mentally alert and well oriented as to time and place and noted "a paresis of the sixth nerve on the left and a suggestive right lower facial paralysis. Pupils were 3m.m. in diameter bilaterally, regular, equal and reacted to light directly and consensually. Convergence was found to be poor. There was no nystagmus. Bilateral papilledema of 2-3 diopters, hemorrhages, exudates and tortuous, irregular veins were present in the eye-grounds. The macular reflex was diffuse. There was no impairment of sensation. The motor power was generally good. Muscle tonus in the left upper extremity was poor. Ataxia and incoordination were present in the left hand in spite of the fact that the patient

was lefthanded. Reflexes on the right were sluggish but active on the left. Romberg's sign was positive. Patient walked on a wide base and was unable to walk heel to toe. He threw the left foot out while the arm was fixed. Turns were made poorly." The recorded impression was, Astrocytoma of the left cerebellar lobe.

During the next few days, a gradual increase of the papilledema to about five diopters was observed. It was noticed also on subsequent examinations that the ataxia which at first was present on the left, shifted to the right, and later was again present on the left.

On December 4, 1944, an operation was performed by Dr. Lambros consisting of suboccipital decompression with biopsy. Dr. Rice reported the tissue to have the characteristic appearance of an astrocytoma.

Within four weeks the papilledema subsided, his gait improved but there was an occasional period of ataxia of the left lower extremity and turns to the left were poorly made. On January 11, 1945, at a second operation, the vermis was split and the roof of the fourth ventricle was exposed. The cerebellar lobes were retracted laterally. A cystic, semi-solid purplish red mass, weighing about twelve grams, was seen to arise from the roof of the fourth ventricle and the greater portion of this mass occupied an area under the left cerebellar lobe. The entire mass was removed.

Following this operation the patient improved remarkably and at the present time has only a slight residual ataxia of his gait.

CEREBELLAR TUMORS OF INFANCY AND CHILDHOOD

Vasilios S. Lambros M.D.

Neoplasms of the central nervous system are by far the most common tumors found in children, exceeding in number tumors from all other sources.

As Critchley[2], Cushing[3], Olivecrona[9] and others have pointed out, a peculiarity of intracranial neoplasms in childhood is their subtentorial dominance. The most frequent types are as follows: (Bailey et al[1])

1. astrocytomas (32 per cent)
2. medulloblastomas (13 per cent)
3. ependymoblastomas (7 per cent)
4. polar spongioblastomas (8 per cent)
5. multiformis glioblastomas (7 per cent)

The last two named occur chiefly in the pons and medulla and are

inoperable because of their malignancy and location. Thus, the discussion in this paper is to be confined to tumors of the cerebellum PHYSIOLOGY: By comparative anatomical studies three fundamental parts of the cerebellum are distinguished:

1. the very old vestibular portion (the archicerebellum)
2. a less primitive spinal portion (the paleocerebellum)
3. a later developed portion (the neocerebellum), which is intimately connected with the cerebral cortex.

The function of the archicerebellum and the paleocerebellum (the spinal part of the cerebellum) is concerned with the modification of proprioceptive automatic standing. Thus, when a tumor involves the vermis of the cerebellum, we can expect the lower extremities to be principally affected and cause difficulty in maintainance of equilibrium while standing or walking.

The intensity of disturbance in function arising from tumors of the neocerebellum varies in proportion with the size of the lesion and with the extent of involvement of the emboliform and dentate nuclei. The resulting symptoms and signs are homolateral and predominate in the extremities; the upper extremities are more affected than the lower. The degree of hypotonia varies with the extent of the cortical lesion. Hypotonia is more marked in the proximal than in the distal muscles although it is usually very marked in the ankles and wrists. Disorders of movement, principally volitional, is the fundamental disturbance. The four most common impairments of volitional movement are:

1. Dysmetria or excessive range of movement. This is the most easily recognized sign.
2. Errors of direction in which there is a tendency to over or undershoot the mark. A variation of the latter may be noticed by a decomposition of movement. Replacing a normal smooth flowing pattern of movement, a disorganization of the uniform pattern occurs. This may be a compensatory mechanism.
3. A disturbance of rate in performance of rapid movements.
4. There is likely to be some impairment of force as evidenced by the weakness of grasp.

Hypotonia may aggravate aberrations of movement but it cannot originate these disturbances. Associated tremors are characteristically terminal and are not affected by closing the eyes. They undoubtedly are related to the disorder of movement. Nystagmus is interpreted by Gordon Holmes[5] as the result of errors and range of

motion, and he believes that it represents a basic incoordination of the eye movements, similar to that which occurs in the skeletal muscles.

PATHOLOGICAL TYPES: The cerebellar lobes are the most common origin for sites of astrocytomas. They have a tendency to become cystic. The cyst has a smooth, glistening wall and is filled with a straw-colored fluid which clots when exposed to air. The protein content is high and bile salts give it a typical color. The cyst is formed by liquefaction of the tumor tissue but the fluid is a transudate from blood. Some astrocytomas are solid with small cysts scattered throughout. Usually they are avascular, gray or grayish red tumors. The predominant cell is the astrocyte of neuroepithelial origin.

Medulloblastomas are usually soft, solid, reddish gray, exceedingly vascular tumors arising in the vermis. They seed and invade the leptomeninges very readily and are very cellular. The cells are more undifferentiated than the astrocytes or spongioblastoma polare. Mitotic figures are numerous. The nuclei have a tendency to be grouped forming pseudorosettes around the strands of cytoplasm. Thin walled sinuses are present throughout and connective tissue stroma is predominant around these vascular channels.

Ependymomas occur near the ventricular walls and with the exception of these walls, are usually sharply circumscribed from the surrounding brain. Very occasionally they have small cysts but more often are solid, tough, avascular growths. A characteristic feature is the grouping of the cells around the avascular sinuses in rosettes.

SEX AND AGE: Astrocytomas show no predilection for either sex. They may occur at any age.

Ependymomas may give symptoms at any time from birth to adolescence. The tendency to predominance in males is slight, and of no significance.

Medulloblastomas definitely show a marked affinity for males and are most common between the ages of three to six. It is the only brain tumor that shows such a definite predilection for sex and age.

GENERAL SYMPTOMATOLOGY: In childhood the signs and symptoms of intracranial tumors can be separated into two groups —those resulting from increased intracranial pressure which are almost the same regardless of the location of the tumor, and those directly attributable to the interference, either by destruction

or compression, with the function of a definite area of the brain.

The signs and symptoms of increased intracranial pressure are fairly constant. Headache, associated with tumors of the pons or medulla are apt to be mild and occur less frequently than with tumors of other sites. Papilledema is present in less than 50 per cent of pontine gliomas. Vomiting is the most constant symptom and occurs in every case. Usually it results from increased intracranial pressure. However tumors of the posterior fossa cause vomiting before there is any evidence of increased intracranial pressure. In these cases it is due to direct irritation, either by invasion or compression of the vagal nuclei in which is situated the reflex mechanism for vomiting. Vomiting is usually associated with nausea which may be severe and persistent. Certain characteristics may be suggestive of its origin. Early in the course, emesis occurs upon arising before breakfast. Later it may occur at any time of the day or night. Emaciation resulting from severe vomiting is most frequently found in pontine gliomas. Remissions in vomiting may occur as the result of a decrease in intracranial pressure by the separation of the sutures.

Headache occurs in about 70 per cent of the cases. It is not a dependable symptom in children. The fact that the sutures separate easily minimizes the intensity. Oftentimes these children are too young to have learned the meaning of headache and are unable to localize their discomfort. The pain is frequently referred to the frontal or occipital areas. Since the dura is supplied by sensory nerves from the opthalmic division of the trigeminal nerve, any tension of the dura will refer pain to the eyes and forehead. A similar type of reflex may cause occipital pain. Oftentimes the cerebellar tonsils and medulla are herniated through the foramen magnum and since the dura mater in this region is supplied by the upper cervical roots, any tension will cause pain in the back of the head and neck.

Diplopia and failing vision are common complaints. Strabismus results in blurring of vision and difficulty in reading. Papilledema will impair visual acuity and if present for a long period, may cause secondary optic atrophy with marked reduction in visual acuity or total blindness.

Enlargement of the head is a distinct phenomenon peculiar to the child's ability to separate the cranial sutures in the presence of increased intracranial pressure. In these cases the typical "cracked pot" sound (Macewen's sign) can be elicited. This will be associated with a prominence and distension of the scalp

veins. Roentgenograms will readily confirm the separation. Occasionally decalcification and erosion of the clinoids can be demonstrated.

Behavior may be affected by increased intracranial pressure, often manifesting itself as a lack of interest in school work or play, and varying degrees of apathy.

Cerebellar fits, extension of the extremities, retraction of the head, cardio-respiratory irregularities, cyanosis and unconsciousness are seen in less than ten per cent of the cases.

The localizing signs are dependent on the disturbance of normal physiological processes. In the flocconodulus or paleocerebellum, the chief disturbances include difficulty in maintaining the trunk erect and the awkward stumbling gait. With involvement of the neocerebellum the resulting symptoms and signs are homolateral and predominate in the extremities with the upper extremities more involved than the lower. These are exemplified by hypotonia, disorders of movement and tremor. It is to be noted that in cases of extensive involvement of the cerebellum either by invasion or compression, the manifestations of a midline tumor may vary from time to time; this may be used as a diagnostic criterion of a midline tumor.

AIDS IN DIAGNOSIS: Diagnostic laboratory procedures are limited and usually not necessary. A large percentage of cerebellar tumors are accompanied by papilledema precluding the use of spinal taps or pneumoencephalograms. In case of doubt, which occasionally occurs in frontal lobe tumors where symptoms and signs may simulate cerebellar tumors, a ventriculogram is necessary. The use of radioactive opaque media is to be decried, most clinics having long since abandoned this procedure. Electroencephalograms (Lambros et al[7]) are of no aid in localizing tumors of the posterior fossa.

TREATMENT AND PROGNOSIS: Since the pathology of the tumor determines the type of surgery to be done, the treatment will be considered from the histological viewpoint.

Ependymoblastomas are benign growths, but because of their location is is often impossible to totally extirpate them. A suboccipital decompression will often suffice and cases have been recorded of patients surviving eight to twelve years with only the decompression. These tumors are insensitive to roentgen therapy.

Medulloblastomas are very malignant tumors, metastasizing readily along the leptomeninges and even if a few cells are

scattered into the cerebrospinal fluid, they seed readily. Obviously with such a malignant growth, it is not wise to attempt its removal. Accordingly, a suboccipital exploration is carried out to confirm the diagnosis. A biopsy is taken and a wide decompression is carried out. The operation is followed by intensive roentgen therapy directed to the posterior fossa and the spinal axis, since the medulloblastoma is an undifferentiated type of tumor and is radiosensitive. Treatment is repeated in three months and thereafter as symptoms warrant. Since these tumors are radiosensitive, the decision to radiate[4] or operate raises a controversial point. Exploration should always precede radiation for the following reasons:

1. The possibility of edema causing death prematurely is ever present.
2. The possibility that the preradiation diagnosis is incorrect such as in instances where extensive astrocytomatous cysts may, by compression, simulate a tumor of the midline. Astrocytomas of the midline are not too uncommon.
3. The fact that roentgen therapy produces irreversible damage cannot be disregarded (O'Connell[8]).

The average survival period following decompression and radiation is eighteen months.

Astrocytomas are benign lessions and comprise the largest group of the cerebellar tumors. The astrocytomas are usually encapsulated, cystic tumors, invariably occurring in the cerebellar lobes where they are accessible and easily dissected free from the surrounding cerebellar tissue. With total extirpation the prognosis is good.

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CLINICO-PATHOLOGICAL CONFERENCE

Directed by — Dr. E. Clarence Rice
Assisted by — Dr. John E. Cassidy
Held Every Tuesday Afternoon at 3:00 P.M.

CASE REPORT NO. 10

Dr. John Cassidy T.W. - 37-2970

T. W., a twelve year old colored girl, was first seen in the out-patient department on September 26, 1944 because of fever, sore throat, and abdominal pain of two days duration. The significant physical findings at this time were enlarged, inflamed tonsils, left catarrhal otitis media, and slight pain on deep abdominal palpation about the umbilicus. Sulfadiazine was prescribed and the child sent home.

Two days later she returned complaining of generalized abdominal pain and some urinary frequency with burning. Fever was still present.

History revealed that in the past there had been frequent attacks of sore throat and epistaxis. She always fatigued very easily. There were no bone, joint or muscle pains.

Menses had begun one year previously. Her last menstrual period occured three weeks prior to the onset of the present illness and following this a profuse creamy vaginal discharge appeared, lasting three days and disappeared spontaneously. The patient admitted having intercourse with a boy in the neighborhood just before this. The remainder of the history was non-contributory.

The physical findings upon admission were much the same as on the previous examination except that the abdominal tenderness was now localized to a region just above the inguinal ligaments. Rectal examination elicited pain when the cervix or parametrial regions were palpated. The remainder of the examination was negative.

The temperature was 101.4° (R); blood pressure 122/92; hemogram showed a mild anemia and a marked leucocytosis, 18,000/cu. mm. with 83% neutrophiles; urinalysis was negative except for 80 mgms of protein. A vaginal smear and culture were taken and later reported as negative for gonococci.

Considering the most likely diagnosis to be a pelvic inflammatory condition, sulfadiazine was given. The abdominal pain persisted; the temperature varied between 101° and 103°; the leucocytosis persisted.

Re-examination on October 6, 1944, eight days after admission revealed the presence of a harsh systolic apical murmur. X-ray of the chest showed the heart to be slightly enlarged with a bulging in the region of the conus arteriosus. The diagnosis of rheumatic fever with mitral regurgitation became evident and salicylate therapy was instituted with a prompt relief of abdominal pain and a drop in temperature to normal. The white blood cell count returned to within normal limits.

An electrocardiogram on October 10, 1944 showed no abnormal findings. The blood pressure taken on October 11, 1944 was 150/105 and this hypertension persisted, varying between 150/105 and 170/110.

Urinalyses showed a persistence of small amounts of albumin and occasionally a few red blood cells. The sedimentation rate remained elevated between 39 and 43 mm per hour.

A P.S.P. test done on October 24, 1944 revealed normal excretion of the dye by the kidneys. Blood chemistry studies showed the cholesterol, total protein, and albumin-globulin ratio to be normal. Blood Kahn was negative on September 28, 1944 and positive on October 24, 1944.

Except for the persistent hypertension, the course in the hospital was uneventful and plans were made to transfer the patient to the Rheumatic Fever Unit at Gallinger Hospital. On October 30, the patient appeared no different than usual. She was sitting up in bed as had been her custom and suddenly fell back, dead.

NECROPSY SUMMARY:

The principal findings were confined to the heart and kidneys.

The heart weighed 340 grams, three times that of the normal for a child of this age. There was marked hypertrophy of the ventricular musculature, especially the left; it averaged 15 mm. in thickness. The mitral valve leaflets were scarred and slightly thickened and along the edge of one cusp was a small bloody area. Microscopic examination showed rather pronounced diffuse polymorphonuclear leucocytic infiltration. No definite Aschoff bodies were seen in the sections examined.

The left kidney weighed 210 grams as compared to the normal for a child this age of 96 grams. Except for this marked enlargement it showed no pathological changes.

The right kidney weighed 63 grams as compared to the normal of 95 grams. The surface presented many large, irregular, confluent white firm areas (infarcts) that occupied well over two-thirds of the organ. The remaining renal tissue was pale and bloodless.

The right renal artery was completely occluded by a firm thrombus, measuring 1.5 cm. in length. Microscopic examination showed organization of the thrombus, but no canalization. There were no essential changes in the wall of the vessel. The remaining organs showed no outstanding pathological changes.

Pathological diagnosis: Rheumatic heart disease with mitral valvulitis and marked hypertrophy of the myocardium; thrombosis of the right renal artery with multiple extensive infarctions of the right kidney; compensatory hypertrophy of the left kidney.

DISCUSSION

Dr. Bernard Walsh—The clinical diagnoses of active rheumatic fever and rheumatic heart disease with mitral valve involvement were confirmed at autopsy. Very surprising, however, was the finding of thrombosis of the right renal artery and the consequent changes in both kidneys.

Before discussing the main questions raised by the unexpected finding of thrombosis of the right renal artery and the patient's sudden death, it might be well to consider briefly the abdominal pain which brought her to the hospital. Observation of large numbers of patients with unmistakeable rheumatic fever has shown that abdominal pain, often severe and accompanied by varying amounts of abdominal rigidity, may be the first symptom of the infection. Each year at this hospital we see five or six patients with rheumatic fever whose presenting symptom is abdominal pain. Occasionally a normal appendix is removed before the diagnosis of rheumatic fever becomes clear. Since thrombosis or embolism of a renal artery rarely, if ever, causes pain, there seems no reasonable doubt but that the abdominal pain in this patient was a manifestation of rheumatic fever.

There are on record several cases of hypertension due to partial or complete occlusion of one renal artery[1], and hypertension has disappeared in patients following the removal of a kidney the artery of which was occluded[2,3]. The occurrence of the occluding thrombus in this child would seem without doubt to account for the appearance of her hypertension.

As to the reason for the thrombosis in our patient, there seems no satisfactory answer. To my knowledge there is no clear evidence that rheumatic fever has ever caused thrombosis of as large an artery as the renal, although there is some evidence that thrombosis may occur due to rheumatic fever in the cerebral, coronary, and other small arteries[4,5,6].

Without preceding coma, convulsions, or heart failure, this

patient's sudden death cannot be attributed to the hypertension. The only logical explanation then would be the rheumatic fever. Unexpected sudden death occurs in patients with active rheumatic fever, but usually only in those with more severe rheumatic fever than this patient seemed to have. Occasionally one sees patients, even very young children, with severe rheumatic fever and heart failure, who may even have recently shown great improvement, suddenly fall back dead while apparently playing or eating and having no special complaint. It is assumed that such patients develop ventricular fibrillation, the result of rheumatic myocarditis. Had this patient lived longer, it is probable that further kidney studies would have revealed the non-functioning of the right kidney, and have led to surgical exploration.

References:

[1] Leiter: Jour. Am. Med. Assn., 1938, *3*: 507.
[2] Leadbetter and Burkland: Jour. Urol., 1938, *39*: 611.
[3] Boyd and Lewis: Jour. Urol., 1938, *39*: 627.
[4] Bruetsch: Arch. Int. Med., 1944, *73*: 472.
[5] Gross, Kugel, and Epstein: Am. J. Path., 1935, *11*: 253.
[6] VonGlahn and Pappenheimer: Am. Jour. Path., 1926, *2*: 235.

CLINICAL PROCEEDINGS OF THE CHILDREN'S HOSPITAL

Washington, D. C.

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Occasionally, the remarks and observations of guest speakers are included in this bulletin when thought to have particular interest. The proximity of the Children's Hospital to the Medical Centers of the Army, Navy and United States Public Health Service affords us the opportunity to invite many distinguished physicians to our conferences.

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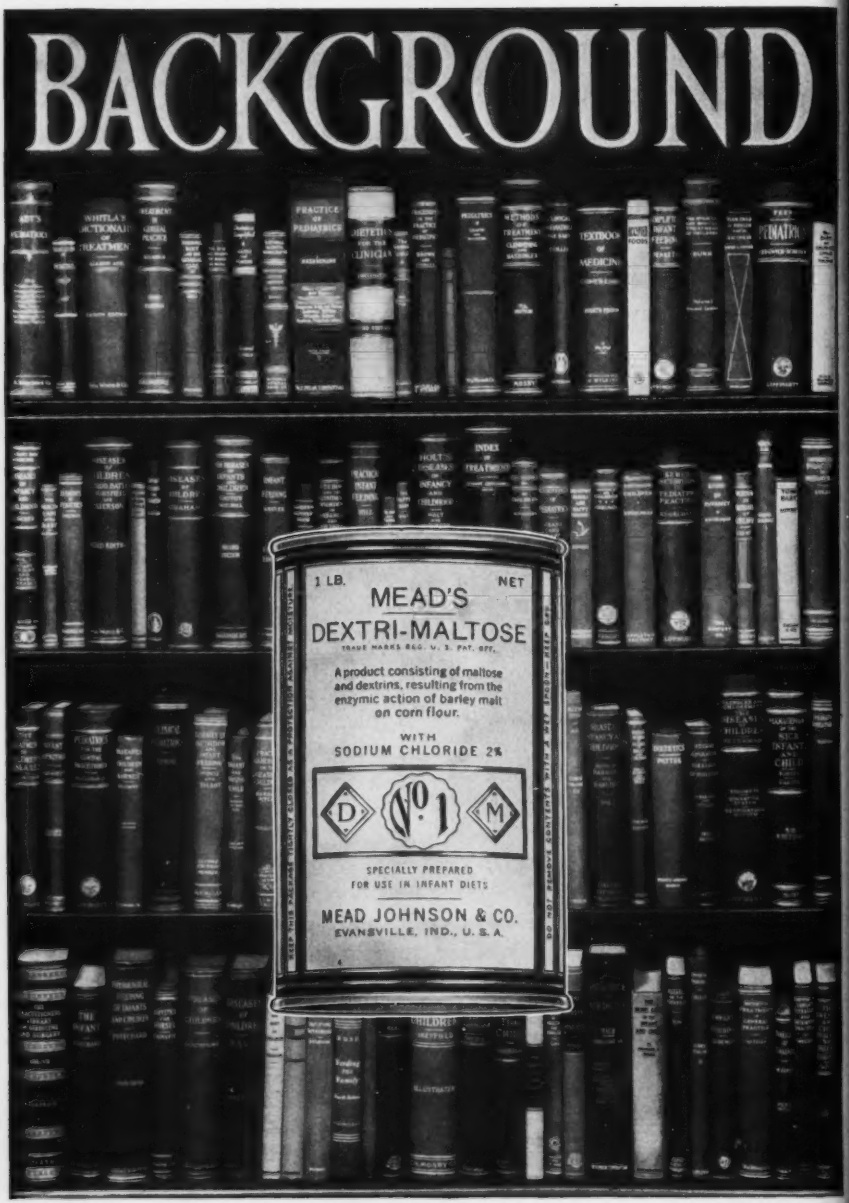
BACKGROUND



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